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Empirical antibiotic therapy: assessment of agreement between pediatricians

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Studies focusing on antibiotic prescribing indicate that approximately one-third of hospitalized infants and children receive antibiotics, often on an empirical basis [1–3]. Almost half of all antibiotic prescriptions have been found to be inappropriate, based on clinical and economic criteria [4]. In addition, serious consequences in terms of mortality and complications can result from inappropriate antibiotic therapy [5]. Because of the rising costs in health care, lack of uniformity in prescribing attitudes and the emergence of antibiotic resistance, monitoring and controlling antibiotic use is of growing concern. Several professional societies have issued urgent statements advocating reduction of the use of antibiotics worldwide by means of strict local antibiotic policies. In order to implement such a policy, it is important to determine on a local and global level the presence or absence of uniformity in antibiotic-prescribing attitudes for in- and outpatients.

In order to study the degree of uniformity of empirical antibiotic therapy in pediatrics, questionnaires with clinical cases were sent to all 156 pediatricians and pediatric residents in the northern part of The Netherlands and to 100 randomly selected pediatricians in Belgium. In The Netherlands, 67 were working in one university hospital, and 89 were divided among 25 regional hospitals. Initial non-responders received up to two additional mailings of the same questionnaire. The questionnaire contained 13 clear clinical situations (Table 1). For each of these cases, an empirical antibiotic treatment was requested, including generic name of the drugs, dose and duration of treatment. Data were analyzed for all Dutch pediatricians (in the university setting and the regional setting) and Belgian pediatricians separately. The survey was conducted anonymously.

In The Netherlands, 30 pediatricians (71%) and 20 pediatric residents (80%) of the university hospital and 62 pediatricians (69.7%) of the community hospitals returned questionnaires, of which 107 (68.6%) were completed and five (3%) were returned without any answers. In Belgium, 38 pediatricians (38%) returned questionnaires, of which 36 (36%) were completed and 2 (2%) were returned without any answers. A widespread variability in choice of antibiotic therapy was found for each case even in the generic class of the antibiotic. Looking at the different generic drugs even less uniformity in choice could be found (data not

Table 1 Number of antibiotic classes chosen for each case with, in parentheses, the number of respondents for the particular case. The following antibiotic classes were defined: penicillins, cephalosporins, aminoglycosides, sulfonamides, vancomycin, quinolones, metronidazole and all different combinations of these individual classes

Case number and description	Pediatricians and residents, The Netherlands (n=112)	Pediatricians, Belgium (n=36)
1. A 3-week-old child with bacterial meningitis	5 (104)	6 (34)
2. A 4-year-old girl with clinically and radiologically proven bacterial pneumonia	4 (106)	4 (36)
3. A 7-year-old boy with sinusitis	4 (103)	3 (36)
4. A 5-year-old girl with pyelonephritis	8 (101)	7 (36)
5. A 4-year-old child with bilateral otitis media	3 (106)	5 (36)
6. A premature infant, with respiratory distress and sepsis	7 (104)	6 (33)
7. A 12-year-old girl with high fever, hypotension, tachycardia and bloody diarrhea	15 (99)	10 (34)
8. An 8-year-old boy with osteomyelitis of the ankle	6 (99)	5 (36)
9. An 8-year-old girl with atypical pneumonia	5 (99)	5 (36)
10. A 3-year-old girl with bacterial meningitis	9 (105)	5 (35)
11. A 4-year-old girl with endocarditis	8 (68)	7 (25)
12. A 2-year-old girl with infected eczema	7 (96)	5 (36)
13. A 9-year-old boy with septic arthritis	4 (88)	4 (31)

shown). The greatest variability was found for central nervous system infections or endocarditis for the Dutch and cases with suspicion of bacteremia or endocarditis for the Belgian pediatricians. Both groups of pediatricians showed least variability for cases with lower respiratory tract infections and otitis media. In addition, the dosage of the chosen therapy showed a considerable variability and did not always comply with the literature or commonly used formularies. For both the Dutch and Belgian pediatricians, greatest variability was found in the dosage of penicillin for central nervous system infections in a range between 13–500 mg/kg and 25–300 mg/kg respectively. Only 26% of the amoxicillin prescriptions were within the accepted range in dosage (200–400 mg/kg) as described in various textbooks of pediatrics. In the Netherlands, a child with suspicion of respiratory tract infection was treated intravenously or orally with a dosage of penicillin between 50 and 200 mg/kg and 10 and 100 mg/kg, respectively. More than 75% were treated with a dosage as suggested in textbooks of pediatrics. For the Belgian pediatricians, the results were comparable. The dosage of the aminoglycosides netilmicin, gentamicin and tobramycin was too low or too high in 23% and 10% of prescriptions in the Netherlands and Flanders, respectively. For central nervous system infections, 60% and 70% of all children were treated with a dosage of ceftriaxone according to the advised regimen in literature. The others were treated with a low dosage. For ceftazidime and cefotaxime 90% and 52%, respectively, were treated with correct dosages. Finally, the suggested duration of therapy showed a remarkable variability for both groups. Again, generally accepted guidelines were breached on several occasions.

In conclusion, considerable variability was found in empirical antibiotic selection among pediatricians and pediatric residents in the Netherlands and Belgium. This variability was evident for selected antibiotics as well as for dose and duration of therapy. The data were derived from written case simulations, which are not always predictive of physicians' actual behavior; however, the cases were clear, straightforward and common. In order to optimize patient care, to achieve a reduction in healthcare costs and to reduce the emergence of drug resistance, antibiotics should be used rationally. Therefore, an urgent need for more appropriate selection and use of antibiotics exists [6,7].

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